Adaptive tuning of Majorana fermions in a quantum dot chain.

Ion C. Fulga,[1] Arbel Haim,[2] Anton R. Akhmerov,[1,3] and Yuval Oreg[2]

[1] *Instituut-Lorentz, Universiteit Leiden, P.O. Box 9506, 2300 RA Leiden, The Netherlands*
[2] *Department of Condensed Matter Physics, Weizmann Institute of Science, Rehovot, 76100, Israel*
[3] *Department of Physics, Harvard University, Cambridge, MA 02138*

We suggest a way to overcome the obstacles that disorder and high density of states pose to the creation of unpaired Majorana fermions in one-dimensional systems. This is achieved by splitting the system into a chain of quantum dots, which are then tuned to the conditions under which the chain can be viewed as an effective Kitaev model, so that it is in a robust topological phase with well-localized Majorana states in the outermost dots. The tuning algorithm that we develop involves controlling the gate voltages and the superconducting phases. Resonant Andreev spectroscopy allows us to make the tuning adaptive, so that each pair of dots may be tuned independently of the other. The calculated quantized zero bias conductance serves then as a natural proof of the topological nature of the tuned phase.